In The Claims

Please cancel claims 1-61.

62. (new) An apparatus for use in acoustic micro-imaging, said apparatus comprising:

a transducer that is adapted to be coupled to a microelectronic sample via a coupling medium;

a controller that is operatively coupled to said transducer, said controller being adapted to cause said transducer to emit a pulse of acoustic energy toward each one of a plurality of three-dimensionally varied points located within a given volume that is defined inside of the microelectronic sample, and to cause said transducer to have, for each one of said pulses, a focal point that is disposed at the same location within the given volume of the microelectronic sample as the corresponding one of the three dimensionally varied points;

said transducer being adapted to receive a reflection signal corresponding to each one of said pulses, each one of said reflection signals comprising an A-Scan of the microelectronic sample that is in-focus at the point within the given volume of the microelectronic sample corresponding thereto; and

wherein all of said reflection signals represent acoustic impedance features present within the given volume defined inside of the microelectronic sample.

63. (new) The apparatus of claim 62, wherein said three-dimensionally varied points represent a series of points in two or more X-Y planes displaced along a Z-axis of said transducer.

64. (new) The apparatus of claim 62, further comprising a data memory that is operatively coupled to said controller and said transducer, said controller being adapted to cause digitized portions of each one of said reflection signals to be stored in said memory.

65. (new) The apparatus of claim 64, wherein one or more of said digitized reflection signals contains both peak reflectance data and at least some off-peak reflectance data.

66. (new) The apparatus of claim 65, wherein one or more of said digitized reflection

signals locations contains substantially all detectable portions of reflectance data.

67. (new) The apparatus of claim 64, wherein said controller is adapted to retrieve selected ones of said digitized reflection signals and to create therefrom a composite digitized signal which represents an in-focus image of any impedance features at point in the given volume of the microelectronic sample that corresponds to each selected one of said reflectance signals.

68. (new) The apparatus of claim 67, wherein said controller is adapted to cause said composite digitized signal to stored in said memory.

69. (new) The apparatus of claim 64, wherein said controller includes a time gate that allows only a desired portion of one or more of said digitized reflectance signals to be stored in said memory.

70. (new) The apparatus of claim 69, wherein said controller is adapted to combine two or more of said in-focus digitized reflection signals into an in-focus image at any location of interest within the microelectronic sample.

71. (new) The apparatus of claim 70, further comprising a display.

72. (new) The apparatus of claim 71, wherein said controller is adapted to cause an in-focus representation of an impedance feature for an area of interest within the microelectronic sample to be displayed on said display.

73. (new) The apparatus of claim 72, wherein said representation is in the form of a virtual sample volume or layer depicting an area of interest within the microelectronic sample.

74. (new) The apparatus of claim 62, wherein said controller includes a gain control circuit that is operatively connected to said probe, said gain control circuit being operable to reduce amplitude errors in any signal that is received by said transducer.

75. (new) An apparatus for use in acoustic micro-imaging to allow a virtual sample volume or spaced virtual sample volume layers which characterize acoustic impedance features in a sample volume of a microelectronic sample to be displayed, said apparatus comprising:

a memory, said memory containing digitized portions of a plurality of reflection signals that are created by

coupling a transducer to a microelectronic sample via a coupling medium,

causing the transducer to emit a pulse of acoustic energy toward each one of a plurality of three-dimensionally varied points located within a given volume that is defined inside of the microelectronic sample,

causing said transducer to have, for each one of said emitted pulses, a focal point that is disposed at the same point within the microelectronic sample as the corresponding one of the three dimensionally varied points within the given volume defined inside of the microelectronic sample,

using said transducer to receive a reflection signal corresponding to each one of said pulses, each one of said reflection signals comprising an A-Scan of the microelectronic sample that is in-focus at the point within the given volume of the microelectronic sample corresponding thereto, all of said reflection signals representing acoustic impedance features within the given volume of the microelectronic sample, and

digitizing at least selected portions of each one of said reflectance signals; and

a controller that is operatively coupled to said memory, said controller being operable to access said memory and to cause a monitor to display to one or more of said digitized reflection signals to reconstruct a visual representation of acoustic impedance features within the given volume of the microelectronic sample.

76. (new) The apparatus of claim 75, wherein said three-dimensionally varied points represent a series of points in two or more X-Y planes displaced along a Z-axis of said transducer.

77. (new) The apparatus of claim 75, wherein one or more of said digitized reflection signals contains both peak reflectance data and at least some off-peak reflectance data.

78. (new) The apparatus of claim 77, wherein one or more of said digitized reflection signals points contains substantially all detectable portions of the reflectance data corresponding thereto.

79. (new) The apparatus of claim 75, wherein said controller is adapted to retrieve selected ones of said digitized reflection signals stored in said memory and to create therefrom a composite digitized signal which represents an in-focus image of any impedance features at location in the microelectronic sample that corresponds to each selected one of said reflectance signals.

80. (new) The apparatus of claim 79, wherein said controller is adapted to cause said composite digitized signal to stored in said memory.

81. (new) The apparatus of claim 75, wherein said controller is adapted to combine two or more of said in-focus digitized reflection signals into an in-focus image at any location of interest within the microelectronic sample.

82. (new) The apparatus of claim 75, wherein said controller is adapted to cause an in-focus representation of an impedance feature for an area of interest within the microelectronic sample to be displayed on said display.

83. (new) The apparatus of claim 82, wherein said representation is in the form of a virtual sample volume or layer depicting an area of interest within the microelectronic sample.

84. (new) The apparatus of claim 75 wherein said image is reconstructed as a plurality of in-focus A-Scans in a single X-Y plane.

85. (new) The apparatus of claim 75 wherein said image is reconstructed as a plurality of in-focus A-Scans in a single X-Z plane.